Prof. Soo Hyeon Kim

Institute of Industrial Science, University of Tokyo

shkim@iis.u-tokyo.ac.jp

Biography

Soo Hyeon Kim is Lecturer for Institute of Industrial Science, University of Tokyo since 2018 and JST PRESTO Researcher since 2017. His research focuses on the development of biomedical microsystems for analyzing single molecules and cells to overcome the limits of the biochemical assays. He studied mechanical engineering at Konkuk University until 2005 (B.Eng.) and Seoul National University until 2007 (M.Eng.). He conducted his PhD research at the department of precision engineering, University of Tokyo from 2007 to 2010. He then pursued his studies as a Post-doc first at Institute of Industrial Science, University of Tokyo until 2011, and at the Graduate School of Engineering, University of Tokyo until 2013. He was Project Research Associate (2013-2015) and Research Associate (2015-2018) in the Institute of Industrial Science, University of Tokyo.

Abstract - Overcome the limits of biochemical assay using advanced biomedical microsystems

Biochemical assays are routinely used to analyze or detect target objects for research and diagnosis. Overcoming the limits of conventional assays on the sensitivity allows us to detect extremely small quantity of target objects and understand biomolecular functions more clearly. One of the promising strategies for high sensitivity is to decrease reaction volume for confining and accumulating target objects into tiny reaction volume. In this talk, I will introduce advanced biomedical microsystems which enable efficient manipulation and detection of target objects even at the single cell and molecule-level by utilizing micro-sized reactors, microfluidics and integrated circuits. The cell-sized microwells are developed for the analysis of intracellular materials from single cells by confining individual cellular contents in small reaction volumes, where individual cells are manipulated by using electrostatic forces with electrodes at the bottom of microwells. Moreover, femtoliter-reactors are utilized to detect a single biomolecule-enzyme complex by accumulating the reaction products from single enzymes inside the ultra-small reaction volume. These advanced biomedical microsystems, allowing high sensitivity detection of target objects, have been being applied to the non-invasive liquid biopsy for the diagnosis and prognosis of cancers to realize personalized medicine.